

4. (Amended) A method for playback of multi-channel sound signals with at least two channels including substantially orthogonal spatialisation characteristics, on a speaker arrangement, said method comprising the steps of:

- a7
- (a) decoding said signals for a set of virtual speakers placed around a listener so as to produce a set of decoded speaker signals with the projection direction of at least two of said virtual speakers being substantially orthogonal; and
  - (b) projecting said set of decoded speaker signals from a series of closely clustered speakers with at least two of said clustered speakers having substantially orthogonal projection directions and being coupled to corresponding substantially orthogonal virtual speaker decoded speaker signals.

[Please add the following new Claims:]

6. A method of increasing the realism of a sound reproduction, the method comprising the steps of:

- a3
- (a) providing a multi-channel sound recording with different channels having substantially orthogonal spatial components; and
  - (b) projecting from a series of speakers placed in the same cabinet, the substantially orthogonal spatial components in a substantially orthogonal projection direction.

7. A method as claimed in claim 6 wherein said substantially orthogonal spatial components include B-format signal components.

#### REMARKS

The applicant has chosen to amend the claims so as to more carefully define the invention over the cited prior art references.

By way of background, the present invention, in arranging the orthogonal spatialisation components for projection attempts to approximate the acoustic radiation pattern of an actual instrument. The standard prior art loudspeaker arrangements does not and can not emulate the acoustic radiation pattern of a real instrument. A standard loudspeaker has a radiation pattern that is unique to the nature of the physical construction of the loudspeaker.

Real instruments such as a violin on the other had have complex radiation patterns that have sound emanating in all directions. Hence the acoustic radiation pattern of a standard loudspeaker and a real instrument are substantially different.

In the preferred embodiment, a series of speakers are arranged in a single cabinet and by driving them in a specific manner the acoustic radiation pattern akin to a real instrument can be emulated.

Existing loudspeaker reproduction systems often attempt to create a sound field around a listener in such a way as to have the listener believe that they are inhabiting another space, different to the one they are presently in. That is, they attempt to transport the listener to the venue of the performance being reproduced.

By contrast, the system of the preferred embodiment is directed to recreating the experience of an instrument being played in the same room as a listener. A real instrument being played in a room will radiate its sound in a highly complex manner. Different frequencies and components of the sound will be radiated in different directions. That is, the frequency response of the direct sound path away from the instrument to the ears of a listener is highly dependent on the orientation of the instrument with respect to the listener. Further, the reflected sound pattern from a real instrument is very different from the pattern emitted by a single loudspeaker or series of arranged loudspeakers, again because of the highly complex and different way the various frequency and transient components of the sound are radiated. The preferred embodiment in projecting the different B-format sound components in an orthogonal manner, approximates such an instrument.

The projection method disclosed in the prior art documents, alone or in combination, do not disclose the idea of projecting orthogonal sound components substantially orthogonally.

US 5757927 to Gerzon et al. discloses a B-format decoder for decoding B-format signals into five channel signals for placement around a listener. The decoder maps the orthogonal components into five channel components in a complex mathematical manner and does not include any form of projection from a single speaker cabinet of orthogonal components in an orthogonal manner as required by claim 1.

US Patent 5784468 to Klayman discloses a system of dual speaker units with each speaker unit further including two orthogonally spaced speakers. Each speaker emits a complex signal such that the signals, when combined, produced enhanced effects for a listener positioned in front of the speakers. However, there is no disclosure in Klayman of emitting any orthogonal components in an orthogonal manner. Indeed there is no disclosure in Klayman of the utilisation of orthogonal components.

Combining Klayman with Gerzon et al. would still fail to teach emission of orthogonal components in an orthogonal manner from a single speaker cabinet. As the basis for doing this is a previously unknown effect, there would also be no expectation of advantage in combining the references.

US 6,084,970 to Aarts et al discloses a system for converting a monaural signal into a stereo signal by dividing up frequency bands into left and right outputs. This citation has no teaching of emission of orthogonal components in an orthogonal manner from a single speaker cabinet.

US 5,889,876 to Billings discloses a speaker system with a plurality of speakers arranged in a hemispherically directed array so as to produce an omnidirectional speaker output. There is no teaching in Billings of emission of orthogonal spatial components in an orthogonal manner from a single speaker cabinet. Indeed, Billings is directed at the opposite of developing an omnidirectional speaker output.

US 5,199,075 to Fosgate discloses a ceiling mounted speaker cabinet but includes no disclosure of the emission of orthogonal spatial components in an orthogonal manner from a single speaker cabinet

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Respectfully submitted,

Enclosures: Appendix A (1 page)

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398</
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a decoder for converting said multi-channel sound signals into a series of speaker outputs for virtual speakers placed in pre-determined positions around a listener and projecting sound towards a listener, with the projection direction of at least two of said virtual speakers being substantially orthogonal;

a multiplicity of speaker elements arranged around said cabinet, said speaker elements coupled with predetermined ones of said series of speaker outputs, with at least two of said speaker elements having substantially orthogonal projection directions from said single speaker cabinet and being coupled to substantially orthogonal virtual speaker outputs of said decoder [ so as to project their acoustic output substantially in the radial direction that a virtual speaker would be placed around said cabinet if said cabinet were said listener to said virtual speakers].

(a) decoding said signals for a set of virtual speakers placed around a listener so as to produce a set of decoded speaker signals with the projection direction of at least two of said virtual speakers being substantially orthogonal; and

(b) projecting said set of decoded speaker signals from a series of closely clustered speakers with at least two of said clustered speakers having substantially orthogonal projection directions and being coupled to corresponding substantially orthogonal virtual speaker decoded speaker signals. [with each of said decoded

speaker signals being projected in a direction of corresponding virtual speaker located around said cluster}.